

PATENT COOPERATION TREATY

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26 JUL 2004

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 020056PC	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/SE2003/000386	International filing date (day/month/year) 07.03.2003	Priority date (day/month/year) 05.04.2002
International Patent Classification (IPC) or national classification and IPC H05B3/42, H05B3/08		
Applicant Sandvik AB et al		

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
 - ☒ (sent to the applicant and to the International Bureau) a total of 2 sheets, as follows:
 - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
 - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

- This report contains indications relating to the following items:

<input checked="" type="checkbox"/>	Box No. I	Basis of the report
<input type="checkbox"/>	Box No. II	Priority
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input type="checkbox"/>	Box No. VI	Certain documents cited
<input type="checkbox"/>	Box No. VII	Certain defects in the international application
<input type="checkbox"/>	Box No. VIII	Certain observations on the international application

Date of submission of the demand 07.08.2003	Date of completion of this report 13.07.2004
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Roland Landström / JA A Telephone No. +46 8 782 25 00

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2003/000386

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
- ☐ publication of the international application (under Rule 12.4)
- ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1 - 5 _____ as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☒ the claims:
- pages _____ as originally filed/furnished
- pages* _____ as amended (together with any statement) under Article 19
- pages* 1 - 2 _____ received by this Authority on 02.07.2004
- pages* _____ received by this Authority on _____
- ☒ the drawings:
- pages 1 _____ as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2003/000386

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1 - 6</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1 - 6</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1 - 6</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Documents cited in the International Search Report:

- A) US 3 518 351 A
- B) US 3 269 806 A
- C) GB 834 739 A

Document A (column 2, line 52 - column 3, line 23, figure 1) discloses a tubular electrical resistance element (10) for a furnace, including three tubular conductors (11, 12, 13) and a connecting member (14). Each conductor (11, 12, 13) includes a high resistance segment (16) which is welded to a low resistance segment (15). A terminal (18) is arranged at the free end of the low resistance segment (15). The low resistance segment (15) and the high resistance segment (16) have the same outer diameter (column 3, lines 5 - 9). The high resistance segment (16) and the low resistance segment (15) correspond to the glow zone and the union, respectively of the application.

The invention claimed in claim 1 differs from what is known from document A essentially in that the union has at its end facing towards the glow zone a successively decreasing wall thickness towards the glow zone and that the glow zone has generally the same inner diameter as the largest inner diameter of the union.

The technical problem is how to avoid sharp temperature gradients.

.../...

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: BOX V

Document C (page 2, line 130 - page 3, line 6, claim 7, figures 1 - 2) discloses an elongated resistance heating element having a heating section (B) welded to a terminal (A1, A2, C1, C2). The terminal (A1, A2, C1, C2) has at its end facing towards the heating section (B) a successively decreasing diameter (cross-sectional area) towards the heating section (B). At the welded joint (F1), the diameter of the heating section (B) is substantially equal to the diameter of the terminal (A1, A2, C1, C2). The heating section (B) and the terminal (A1, A2, C1, C2) correspond to the glow zone and the union, respectively of the application.

The invention claimed in claim 1 differs from what is known from document C essentially in that the electrical resistance element is tubular, that the glow zone and the union have generally the same outer diameter, that the union has at its end facing towards the glow zone a successively decreasing wall thickness towards the glow zone and that the glow zone has generally the same inner diameter as the largest inner diameter of the union.

Document B (column 9, lines 49 - 67, figures 1 - 2) shows a tubular heating element having two terminals.

The cited prior art does not give any indication that would lead a person skilled in the art to the claimed resistance element. A combination of the features of, for example, documents A and B would not lead to the resistance element claimed in claim 1. Therefore, the claimed invention is not obvious to a person skilled in the art.

Accordingly, the invention defined in claims 1 - 6 is novel and is considered to involve an inventive step. The invention is industrially applicable.

Claims

1. An electrical resistance element comprising a glow zone and two power supply terminals, where the glow zone (2) of the element (1) is tubular, c h a r a c t e r i s e d in that a union (5,6) is provided between respective terminals (3, 4) and respective ends (7, 8) of the glow zone (2), in that the union (5,6) is tubular and in that the union (5, 6) has generally the same outer diameter as the glow zone (2); and in that the union (5, 6) has at its end facing towards the glow zone (2) a successively decreasing wall thickness towards the glow zone and in that the glow zone (2) has generally the same inner diameter as the largest inner diameter of the union (5, 6).

2. A resistance element according to Claim 1, c h a r a c - t e r i s e d in that the successively decreasing wall thickness follows the function $r = \frac{r_0}{\sqrt{l_0}} \sqrt{l}$, where l coincides with the longitudinal axis of the union (5,6), r corresponds to the inner radius of the union, l_0 corresponds to the length along which the wall thickness decreases, and r_0 corresponds to the largest inner radius of the union.

3. A resistance element according to Claim 1 or 2, c h a r - a c t e r i s e d in that the largest inner radius of the union (5,6) is 3 - 5 times larger than its smallest inner radius.

4. A resistance element according to any one of the preceding Claims, c h a r a c t e r i s e d in that the proportions of the element (1) are such that in the case of an element with a glow zone (2) that has an outer diameter of about 12

mm its inner diameter will be about 10 mm while the union (5, 6) will have an outer diameter of about 12 mm and a smallest inner diameter of about 3 mm while the successively decreasing wall thickness of the union (5,6) will extend through a distance of about 16 mm.

5. A resistance element according to any one of the preceding Claims, characterised in that respective union (5, 6) is welded to respective ends (7, 8) of the glow zone.

6. A resistance element according to any one of the preceding Claims, characterised in that respective union (5, 6) and respective terminals (3,4) together form a one-piece structure.